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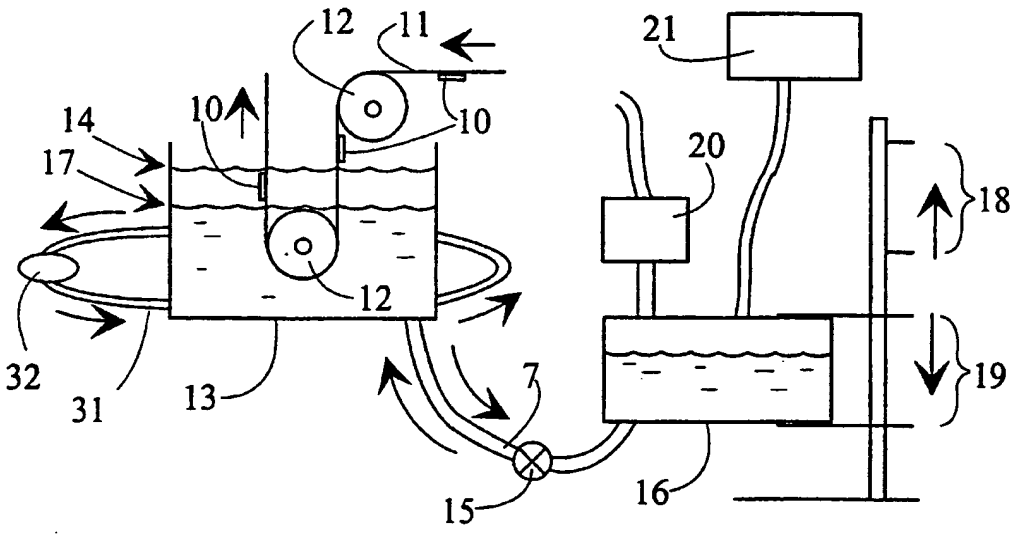
*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

(54) Title: METHOD FOR COATING AN OPTICAL OBJECT, SUCH AS A MOBILE PHONE LENS




(57) Abstract: The invention relates to a method for coating an optical object (10, 22) such as a mobile phone lens etc., a spectacle lens etc., producing a wear-resistant hard coating on the surface of the optical object e.g. by means of UV varnish. The object (10, 22) is placed in a vessel (13) already containing or supplied with coating agent, and then the coating agent level (14) is lowered at a given rate under control, so that a coating agent layer remains on the surface of the object and is dried e.g. by UV radiation to form a wear-resistant surface.

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# Method for coating an optical object, such as a mobile phone lens

This invention relates to a method for coating an optical object, such as a mobile phone lens, a spectacle lens etc., producing a wear-resistant hard coating on the surface of the optical object by means of UV varnish, for instance.

All the methods known *per se* for coating optical objects have the drawback of entailing a very high error percentage, because the coating has not been applied evenly over the surface of the optical object. Conventional methods include spray painting, dipping an optical object into a varnish vessel or raising the varnish vessel to the optical object, with the object being stationary and the vessel moving up and down. The moving of an optical object or a vessel always generates small vibrations, which entail errors in the coating.

The object of the present invention is to provide a new type of method for coating optical objects. The method of the invention is characterised in placing the object in a vessel already containing or supplied with coating agent, and then the level of the coating agent is lowered at a given rate under control, so that a coating layer remains on the surface of the object and is dried e.g. by UV radiation, forming a wear-resistant surface. All tests have proved that the rate of lowering the coating agent level can be controlled exactly to the desired duration and even accelerated or retarded at the final stage by lowering the level through a throttle valve, for instance. The discharge of the coating agent from the vessel is completely stabilised and laminar. The method does not cause even minor vibrations.

Various embodiments of the invention are described in the dependent claims of the set of claims.

The invention is explained below by means of an example and with reference to the accompanying drawings, in which

figures 1 and 2 show a dip method known *per se*
figure 3 shows the connection of two vessels
figure 4 shows a level control system of one embodiment and
figure 5 shows the coating technique of another embodiment.

Figure 1 indicates with arrows how the object 1 is either lifted upwards as indicated by arrow 2 or the vessel 3 is lowered as indicated by arrow 4. In figure 2, the vessel

3 has been lowered so that the object 1 has emerged from the coating agent and is subsequently dried. However, the method has proved to cause small vibrations, which produce visible undulating errors on the surface of the object.

When the vessel 5 in figure 3 is lifted and lowered as indicated by arrows 6, a laminar flow is produced in pipe 7 as indicated by arrows 8, and then the level of the coating agent in the vessel 9 will rise and sink without vibrations.

In figure 4 the object 10 is moved along a given path 11 to the vessel 13 guided by sheaves 12 and is stopped below the liquid level 14 of the coating agent, and then the coating agent is evacuated through the valve 15 into the tank 16 with the object remaining above the liquid level 17 in its totality. Then the object 10 is moved forwards along the path 11 to the following process step, i.e. the drying step. The tank 16 is then lifted into upper position 18 and the liquid level 17 is raised to point 14 using the valve 15. Meanwhile, the following object has been taken by the path 11 to a location below the level 14. The tank 16 is shifted into lower position 19, and the process steps above are repeated with the use of the valve 15. The tank 16 may be connected to a compressed air source 20, which generates overpressure in the tank, thus serving as a substitute for a shift of the tank into upper position 18. According to calculations, the coating of one object or of two adjacent objects takes about 15 seconds. Coating agent is added from the tank 21 into the tank 16 as it is consumed. The vessel 13 may be equipped with an additional liquid circulation system 31 comprising a filter 32, which purifies the liquid contained in the tank continuously.

Figure 5 shows how the object 22 is suspended from a chain conveyor 23. In this method the vessel is moved downwards as indicated by arrow 24 so that the object arriving on the chain conveyor moves above the vessel, and then the vessel is raised against stoppers 25, and will thus remain firmly in position. Coating agent is introduced into the vessel as indicated by arrow 26 implementing the methods mentioned above, and the liquid level is subsequently lowered to point 27, also using the methods above, and then the entire vessel is lowered so as to allow the chain conveyor 23 to move the object forwards and to bring the following object to a location above the tank. These process steps are repeated. When small bubbles or any dust particles arise on the liquid surface, they will flow over the edge 28 and through the filter 29 and back into the vessel through a sealable trough 30.

The inventions is obviously not limited to the example above, but may vary within the scope of the following claims.

## Claims

1. A method for coating an optical object (10, 22), such as a mobile phone lens, a spectacle lens etc., producing a wear-resistant coating on the surface of the optical object e.g. by means of UV varnish, **characterised** in that the object (10, 22) is placed in a vessel (13) already containing or supplied with coating agent, and then the level (14) of the coating agent is lowered at a specific rate under control, so that a layer of coating agent remains on the surface of the object and is dried e.g. with UV radiation to form a wear-resistant surface.

2. A method as defined in claim 1, **characterised** in that the object (10) is moved guided by sheaves (12) along a given path (11) into a vessel (13) and is stopped below (14) the liquid level of the coating agent, and the coating agent level is then lowered so that the object will be located above the liquid level (17) in its totality, and then the object (10) is moved forwards and the process step is repeated for the subsequent object.

3. A method as defined in claim 1, **characterised** in that the object (22) is suspended from a chain conveyor (23), the vessel (13) being raised so that the object is totally immersed under the liquid level (14) in the vessel, and after this the coating agent level is lowered so that the object is located above the liquid level (27) in its totality, and then the vessel (13) is lowered (24) so as to allow the chain conveyor (23) to move the object forwards, and the subsequent suspended object takes a position above the vessel (13), and the process steps are repeated.

4. A method as defined in any of the preceding claims. **characterised** in that the vessel (13) is connected with a hose (7) to a vertically movable liquid tank (16), and by moving the tank upwards, the liquid level in the vessel is regulated upwards, and by moving the tank downwards, the liquid level in the tank is regulated downwards.

5. A method as defined in claim 4, **characterised** in that the tank (16) is connected to a compressed air source (20), which serves to generate overpressure in the tank.

6. A method as defined in any of the preceding claims, **characterised** in that the vessel (13) has been connected with a lateral trough (30) comprising a filter (29), through which the coating agent is brought into circulation and recirculated to the vessel (13).

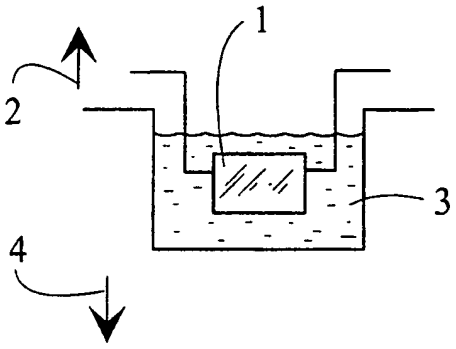


Fig. 1

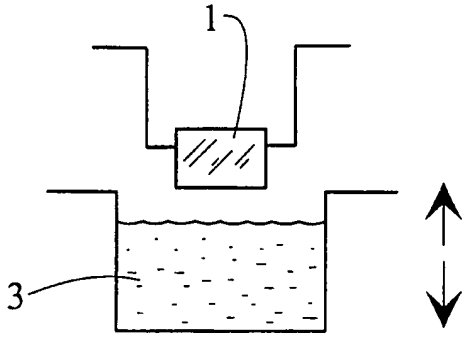


Fig. 2

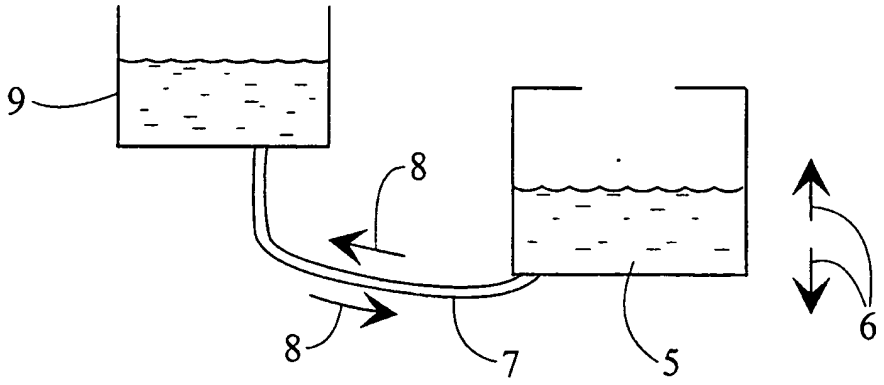


Fig. 3

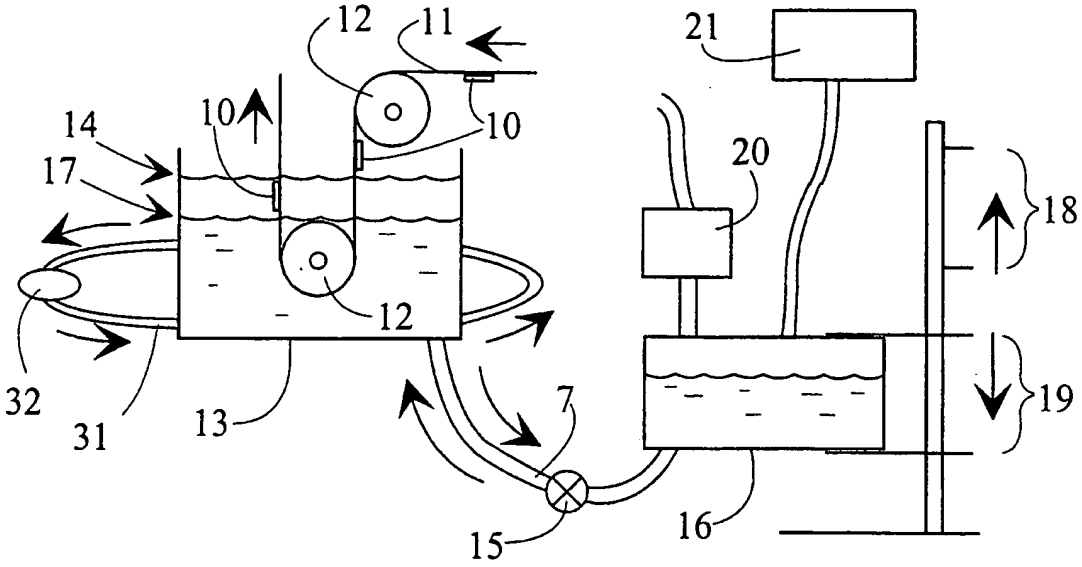
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Fig. 4

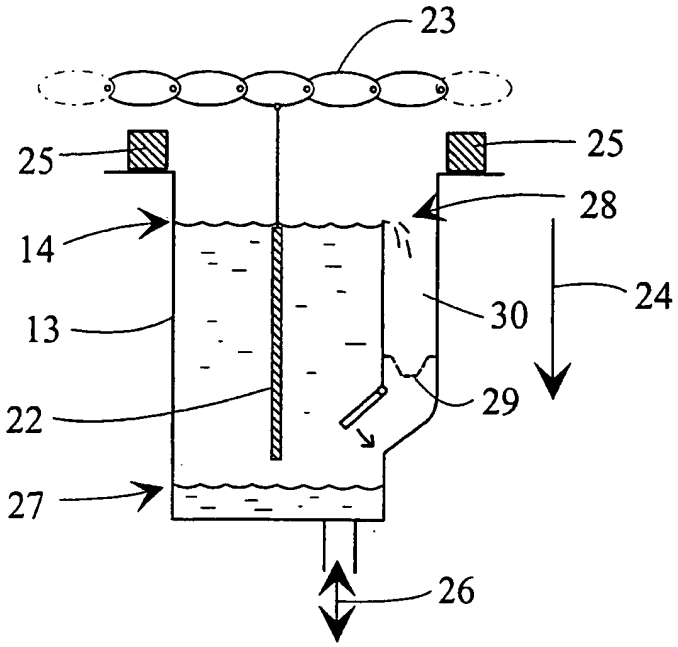
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Fig. 5

# INTERNATIONAL SEARCH REPORT

International application No.
PCT/FI 00/01025

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: B05C 3/09, G02B 1/10
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: B05C, G02B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| A | US 3675622 A (GRIFFIN), 11 July 1972 (11.07.72), figures 1,2, claims 1-10,16 -- | 1-3,6 |
| A | US 4204498 A (INVANCIC), 27 May 1980 (27.05.80), figure 2, claims 1-3,5,6 -- -------- | 1,2,8,9 |

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
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"&" document member of the same patent family

| Date of the actual completion of the international search | Date of mailing of the international search report |
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Information on patent family members

05/02/01

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| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|---|---|---|---|
| US 3675622 A | 11/07/72 | NONE | |
| US 4204498 A | 27/05/80 | NONE | |